

chase of land with which the purchaser has complied, but in which the vendor has failed, a court of equity will take jurisdiction, and if it be seen that the vendor, from subsequent sales or otherwise, cannot comply with a decree for a specific performance, the court will adjudge compensation in damages. So here, the court will grant the relief which the complainants, under their contract, are entitled to have, if such relief can be obtained from the county, but if by reason of intervening obstacles since the contract was made whether arising from laches or default of its officials or repealing legislation, this cannot be secured, an alternative and compensatory decree, that is, one for a money equivalent in the form of damages, will be directed: And as this has been done in the present case, the decree is

*Affirmed.*

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TILGHMAN v. PROCTOR.

1. Letters-patent for a process, irrespective of the particular mode or form of apparatus for carrying it into effect, are admissible under the patent laws of the United States.
2. To sustain such letters, the patentee should be the first and original inventor of the process, and claim it in them. If the means of carrying it out are not obvious to ordinary mechanics skilled in the art, his specification should describe some mode of carrying it out which will produce a useful result.
3. A party who subsequently discovers a new mode of carrying out a patented process, and obtains letters-patent therefor, is not entitled to use the process without the consent of the patentee thereof.
4. *Mitchell v. Tilghman* (19 Wall. 287) reviewed and overruled, and the letters-patent No. 11,766, granted Oct. 3, 1854, to Richard A. Tilghman, and subsequently renewed and extended, relating to the manufacture of fat acids, sustained as letters for a process.
5. *O'Reilly v. Morse* (15 How. 62) and *Neilson v. Thompson* (Web. P. C. 275) commented upon and explained.

APPEAL from the Circuit Court of the United States for the Southern District of Ohio.

This is a suit in equity brought by Richard A. Tilghman, against William Proctor, James Gamble, W. A. Proctor, James

N. Gamble, and George H. Proctor, complaining of their infringement of letters-patent No. 11,766, granted to him, bearing date Oct. 3, 1854, and subsequently renewed and extended, for a process for obtaining free fat acids and glycerine from fatty bodies. The answer denies the validity of the letters and the alleged infringement of them. On a final hearing upon the pleadings and proofs, the bill was dismissed, and he appealed. The case is fully stated in the opinion of the court.

*Mr George Harding* for the appellant.

*Mr Charles B. Collier* and *Mr Matthew H. Carpenter* for the appellees.

MR. JUSTICE BRADLEY delivered the opinion of the court.

This case involves a consideration of the same patent which was the subject of litigation in the case of *Mitchell v Tilghman*, reported in 19th Wallace, 287. The evidence in the present case, which is quite an unwieldy mass, is much the same as in that, being supplemented, however, by the testimony of the patentee respecting the nature of his original experiments and the practicability of using profitably the coil apparatus described in the patent, together with certain exhibits relating to the novelty of the alleged invention. Upon the renewed consideration which has been given to the subject, the court is unanimously of opinion, contrary to the decision in the *Mitchell* case, that the patent of Tilghman must be sustained as a patent for a process, and not merely for the particular mode of applying and using the process pointed out in the specification, and that the defendants have infringed it by the processes used by them.

The patent in question relates to the treatment of fats and oils, and is for a process of separating their component parts so as to render them better adapted to the uses of the arts. It was discovered by Chevreul, an eminent French chemist, as early as 1813, that ordinary fat, tallow, and oil are regular chemical compounds, consisting of a base which has been termed glycerine, and of different acids, termed generally fat acids, but specifically, stearic, margarine, and oleic acids. These acids, in combination severally with glycerine, form stearine, margarine, and oleine. They are found in different

proportions in the various neutral fats and oils, stearine predominating in some, margarine in others, and oleine in others. When separated from their base (glycerine), they take up an equivalent of water, and are called free fat acids. In this state they are in a condition for being utilized in the arts. The stearic and margaric acids form a whitish, semi-transparent, hard substance, resembling spermaceti, which is manufactured into candles. They are separated from the oleic acid, which is a thin oily fluid, by hydrostatic or other powerful pressure the oleine being used for manufacturing soap, and other purposes. The base, glycerine, when purified, has come to be quite a desirable article for many uses.

The complainant's patent is dated the third day of October, 1854, and relates back to the ninth day of January of that year, being the date of an English patent granted to the patentee for the same invention. It has but a single claim, the words of which are as follows. "Having now described the nature of my said invention, and the manner of performing the same, I hereby declare that I claim, as of my invention, the manufacturing of fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure."

In the case of Mitchell, the majority of the court was of opinion that in the application of the process thus claimed the patentee was confined to the method of using the process particularly pointed out in the specification, and as, by that, it was proposed to produce a very rapid separation of the fatty elements by the use of a high degree of heat, the operation being effected in the space of ten minutes by forcing the fat, mixed with water, through a long coil of strong iron tube passing through an oven or furnace where it was subjected to a temperature equal to that of melting lead, or 612° Fah., it was concluded by the court that the producing of the same result in a boiler subjected to only 400° Fah., and requiring a period of several hours to effect the desired separation, was not an infringement of the patent, although the process by which the effect was produced — namely, the action of water, in intimate mixture with the fat, at a high temperature and under a sufficient pressure to prevent the formation of steam — was undoubt-

edly the same. On further reflection, we are of opinion that, in the case referred to, sufficient consideration was not given to the fact that the patent is for a process, and not for any specific mechanism for carrying such process into effect.

In order to have a clearer understanding of the question, it is necessary to advert briefly to the history of the art, and then to examine the terms of the patent in greater detail.

It is conceded by the complainant that two different processes for effecting a decomposition of fats into their component elements had been in practical operation prior to his invention. These processes were called respectively the alkaline saponification process, and the sulphuric-acid distillation process. The first consisted of the manufacture of the fat into soap by the use of lime or other alkali, and then, of the decomposition of the soap, so produced, into the fat acids by the aid of hydrochloric or dilute sulphuric acid. The decomposition of the soap was, by a subsequent improvement, effected by distillation in an atmosphere of steam. The other process, called the sulphuric-acid distillation process, consisted of the direct saponification of fat by means of concentrated sulphuric acid, and the subsequent distillation over of the resulting fatty acids. By this process, however, the glycerine was destroyed.

The first of these processes was patented by Gay Lussac and Chevreul in 1825, but was not brought into successful operation in the manufacture of stearic candles until improved by De Milly in 1831. The second process was proposed and developed between 1840 and 1850. It was extensively used during and after that period by the large manufacturing firm of E. Price & Co., of London, and their successors, Price's Patent Candle Company. Mr. G. F. Wilson, one of the shareholders in that establishment, and apparently a man of accurate knowledge on this subject, read various papers illustrative of the history of the manufacture before learned societies in England, extracts from which are contained in the record, and throw considerable light on the matter. It appears from his statements that the distillation of the saponified fat, whether saponified by an alkali or by sulphuric acid, was often accompanied by prejudicial effects from the access of atmospheric air to the contents of the still. To remedy this,

he and his associates adopted and patented the introduction of superheated steam into the still or vat containing the fat acids, which excluded atmospheric air, and carried over the fatty vapors into the receiver in a more perfect condition than they had before been able to obtain them. These patents were taken out in 1843. In the following year, the same parties, Gwynne and Wilson, found, what Dubrunfaut had found two or three years before, that palm-oil, which is very fusible and manageable, can be distilled in its crude state, in the manner last described, that is, by the introduction of steam into the still, without the intervention of saponification, and the distilled product being then steam-boiled in water, acidulated with sulphuric acid, and the water allowed to settle and separate, the resulting substance would be a fat acid. It is not shown that this process was ever carried into successful operation prior to Tilghman's patent, and judging from what was done by the Price Patent Candle Company in the way of improvement immediately after becoming acquainted with Tilghman's process, it is to be inferred that the steam-distillation process (without saponification) was still an unsuccessful experiment when his patent was issued. This experiment, however, must be regarded as the nearest approach to the process of Tilghman of anything done in the art prior to it.

We do not regard the accidental formation of fat acid in Perkins's steam cylinder from the tallow introduced to lubricate the piston (if the scum which rose on the water issuing from the ejection pipe was fat acid) as of any consequence in this inquiry. What the process was by which it was generated or formed was never fully understood. Those engaged in the art of making candles, or in any other art in which fat acids are desirable, certainly never derived the least hint from this accidental phenomenon in regard to any practicable process for manufacturing such acids.

The accidental effects produced in Daniell's water barometer and in Walther's process for purifying fats and oils preparatory to soap-making, are of the same character. They revealed no process for the manufacture of fat acids. If the acids were accidentally and unwittingly produced, whilst the operators were in pursuit of other and different results, without exciting

attention and without its even being known what was done or how it had been done, it would be absurd to say that this was an anticipation of Tilghman's discovery

Nor do we regard the patent of Manicler, which was taken out in 1826, as anticipating the process of Tilghman. It is true that he directs a mixture of fat with about one-quarter of its weight of water to be placed in a boiler, and subjected to a heat sufficient to create a pressure equal to one atmosphere above the natural atmospheric pressure (or about 250° Fah.), the boiler being provided with a safety-valve which would secure that degree of pressure. But, subject to this pressure, the patent directed that the mixture should be made to boil, and of course that the water should be converted into steam the words are, "Apply fire to this digester to melt and digest the contained tallow or fat and water and keep up a rapid ebullition during about six hours." It is probable, therefore, that any decomposition of the fat which may have been produced by this process was due to the steam formed and passing through the fat, as no means appears to have been adopted for keeping up the mixture of the fat and water. But we have no evidence that the process was ever successful in practice. One of the defendants' witnesses testifies that he tried it, and though he got some results, he adds this pregnant observation "To transform all the fat in this way at so low a temperature would have required many days." He only pretends that the sample which he obtained showed by its appearance, as well as by its acid action, that the separation had commenced. Evidently therefore, this was but an abandoned experiment, since we never hear any more of it from 1826 down to the trial of this cause.

It is unnecessary to examine in detail other alleged anticipations of Tilghman's process. We believe that we have specified the most prominent and reliable instances.

Tilghman's discovery was made in 1853, and was, in brief, this "That the fat acids can be separated from glycerine, without injury to the latter, by the single and simple process of subjecting the neutral fat, whilst in intimate mixture with water, to a high degree of heat under sufficient pressure to prevent the water from being converted into steam, without the

employment of any alkali or sulphuric acid, or other saponifying agent, the operation, even with the most solid fats, being capable of completion in a very few minutes when the heat applied is equal to that of melting lead, or 612° Fah., but requiring several hours when it is as low as 350° or 400° Fah. The only conditions are, a constant and intimate commixture of the fat with the water, a high degree of heat, and a pressure sufficiently powerful to resist the conversion of the water into steam. The result is, a decomposition of the fatty body into its elements of glycerine and fat acids, each element taking up the requisite equivalent of water essential to its separate existence, and the glycerine in solution separating itself from the fat acids by settling to the bottom when the mixed products are allowed to stand and cool. In this process a chemical change takes place in the fat in consequence of the presence of the water and the active influence of the heat and pressure upon the mixture.

We are satisfied that Tilghman was the original discoverer of this process. His priority was acknowledged at the time by those most interested to question it. Mr. Wilson, to whose statements reference has been made, and who is perhaps more justly entitled than any one else to claim an anticipation of Tilghman's discovery, makes no such pretension, but, on the contrary, concedes Tilghman's right to priority, and, indeed, Price's Patent Candle Company, of which Mr. Wilson was a member and director, took a license under Tilghman's English patent.

As having some bearing upon the proper construction of the patent in suit (which will presently be more particularly examined), it is proper to observe that Tilghman's actual invention, as demonstrated in his experiments made in 1853, before making any application for a patent, was not confined to the use of a coil of pipe in a heated chamber or furnace for effecting the process which he claims, but was frequently exhibited by using a simple digester, filled nearly full with a mixture of fat and water, and heated in a gas stove, or in a vertical position over a gas lamp, the mixture of fat with the water being kept up by a loose metallic rod or jumper, which thoroughly mixed the contents when the digester was shaken. Sometimes

the digester was heated in a horizontal position, and, being provided with thin copper partitions fixed inside, was made to revolve in order to cause a more perfect mixture of the materials. In using the digester, it not being provided with a safety-valve, a small space was left at the top for the formation of sufficient steam to prevent, by its elasticity, the vessel from exploding.

In making these experiments Tilghman not only varied the apparatus, but applied different degrees of heat in the operation. The following is his account of some of these proceedings. He says "Before applying for my patent I had made many experiments in decomposing by water at temperatures below melting bismuth, sometimes in the coil form of apparatus, but most frequently in digesters. The lowest temperature tried by me was three hundred and fifty degrees Fah. (350° F), or 120 pounds pressure continued for four hours. The digester was as usual in a vertical position, but the heat was in this case given by an oil-bath. I obtained both fat acids and glycerine in this experiment, but in such small quantities as to prove that though the decomposition did go on at that heat, yet it was very slow compared with the higher heats. I find notes of another experiment, July 15, 1854, in the coil apparatus, with palm-oil, made at the melting-point of tin, 440° Fah., 360 pounds pressure. It was pumped through the coil very slowly, so as to give about thirty minutes' heat, and found to be partly decomposed, so that it was returned to the inlet end of the apparatus and pumped through a second time at the same rate and heat, which produced perfect decomposition of the palm-oil into fat acids and solution of glycerine. Ten minutes' exposure would have perfectly decomposed palm-oil at the heat of melting bismuth, 510° Fah. Yet I found 70° lower heat required six times as long to produce the same effect. I had often decomposed tallow at 510° Fah. before taking out my patent, not in the coil apparatus, but in the simple vertical digester. In this case I had to allow increased time on account of the imperfect contact of the fat and water in addition to that required by the diminished temperature."

In the course of his testimony, Tilghman explains why, in his patent, he specially recommended the use of the high tem-

perature of melting lead in applying his process to practical use. He says "Many experiments had shown me that at these higher temperatures the decomposition was carried on with the greatest economy of fuel and cost of apparatus. When in London in 1847, I had found Perkins' house-warming apparatus, consisting of coils of hundreds of feet of pipe, containing water at the temperature of melting lead, had long been in extensive domestic use there. On returning to London in 1853, I found the same apparatus largely used for heating bakers' ovens. As I thus found such heats and pressures were perfectly practical and safe, as well as economical, I thought I was bound to describe my invention in what I then believed to be the best mode of carrying it out, and that, as I was the discoverer of the chemical fats, I could then claim broadly as my process the use of water highly heated and under pressure to decompose fats, no matter what temperature or apparatus was used."

And being asked for his present view as to the practicability, economy, and safety of the higher temperatures as compared with lower temperatures, he said "I think the high-pressure apparatus is much more economical, both in the first cost and in the expense of working. Its principal disadvantage is that ordinary engineers are not familiar with its management, and consequently dislike it."

In December, 1853, Tilghman, having completed his experiments to his own satisfaction, filed a caveat in the Patent Office preparatory to taking out a patent for his invention. In this caveat he says "The invention consists in subjecting animal and vegetable fatty and oily substances containing glycerine to a high temperature and pressure in close vessels, mixed with different agents, according to the effect desired to be produced upon the fatty matter. Thus, when I wish to convert the neutral fatty substances into fatty acids and glycerine, I pump a mixture of the fat and water, under great pressure, through a series of strong metal tubes, kept at about the heat of melting lead, and provided with a cooling-worm and safety-valve at its outlet. The neutral fatty substance is decomposed by the process, and the fat acid and solution of glycerine which issue through the safety-valve separate by settling."

Tilghman soon after repaired to England and took out a patent there, dated the ninth day of January, 1854, and sealed the 25th of March. He immediately put in operation an apparatus for exhibiting his process on a small scale. Mr. Wilson, before mentioned, witnessed his experiments, and thus speaks of them in a paper communicated to the Journal of the Society of Arts, Jan. 25, 1856 —

“In January, 1854, Mr. Tilghman, an American chemist, who has studied all that has been published here and in France on the subject of acidification and distillation of fatty bodies, obtained a patent for exposing fats and oils to the action of water at a high temperature and under great pressure, in order to cause the combination of the water with the elements of the neutral fats, so as to produce at the same time free fat acids and solution of glycerine. He proposed to effect this by pumping a mixture of fat and water, by means of a force-pump, through a coil of pipe heated to about 612° Fah., kept under a pressure of about 2,000 pounds to the square inch, and he states that the vessel must be closed, so that the requisite amount of pressure may be applied to prevent the conversion of water into steam. This is, all must admit, a beautiful, original, chemical idea, well carried out, it has yet to prove how far it can compete successfully with distillation. We have made an arrangement with Mr. Tilghman which will give us the means of testing its commercial merits.”

Mr. Wilson goes on to state that this process of Tilghman suggested to them the idea of distilling fats by passing steam into them at a high temperature whereby to resolve them into glycerine and fat acids. They found the plan successful, and that the glycerine distilled over with the fat acids, but no longer combined with them, and, in July, 1854, they took out a patent for that process. In a paper read before the Glasgow meeting of the British Association for the Advancement of Science, in September, 1855, Mr. Wilson thus refers to the course of discovery which took place in this branch of manufacture —

“By our first improvement in separating the fat acids from neutral fats, the glycerine was decomposed by the direct action of concentrated sulphuric acid at a high temperature, and all that remained of it was a charred precipitate. A new process for decom-

posing neutral fats by water under great pressure coming under our notice" [referring to Tilghman's process] "led us to look again more closely into our old distilling processes, and the doing this showed, what we had often been on the brink of discovering, that glycerine might be distilled.

"In our new process the only chemical agents employed for decomposing the neutral fat, and separating its glycerine, are steam and heat, and the only agents used in purifying the glycerine thus obtained are heat and steam, thus all trouble from earthy salts or lead is escaped.

"Distillation, however, purifies the impure glycerine of the old sources.

"On the table is a series of products of palm-oil, which will serve to illustrate the process. Steam, at a temperature of from 550° to 600° Fah., is introduced into a distillery apparatus containing a quantity of palm-oil. The fatty acids take up their equivalents of water, and the glycerine takes up its equivalent, they then distil over together. In the receiver the condensed glycerine, from its higher specific gravity, sinks below the fat acids."

We quote more fully from this paper, because it is a contemporary acknowledgment, made by a man who stood in the front rank of those who understood, and whose interest it was to understand, the most advanced process of resolving fats and oils into their component parts, that Tilghman's "process for decomposing neutral fats by water under great pressure" was "a new process," and who, with his associates, took hints from it for making new departures and improvements in the art. The statements of Mr. Wilson on this subject are corroborated by other witnesses. Indeed, nearly all those competent to speak on the subject state, or admit, that the process of decomposing fats into glycerine and fat acids by mixing them with water, and subjecting the mixture to a high degree of heat under a pressure sufficient to prevent the conversion of the water into steam, was not known in the arts prior to Tilghman's discovery. The testimony of some experts to the contrary is based upon their construction of certain patents and publications produced in evidence, the most important of which have already been adverted to.

The question then arises, Has Tilghman secured the exclusive right to the process of which he was thus the inventor?

An examination of the patent itself, which the preceding remarks will enable us better to understand, will show, we think, that it was intended to and does cover and secure to the patentee the general process which has been described, although only one particular method of applying and using it is pointed out.

The specification describes the invention as follows —

“My invention consists of a process for producing free fat acids and solution of glycerine from those fatty and oily bodies of animal and vegetable origin which contain glycerine as their base. For this purpose, I subject these fatty or oily bodies to the action of water at a high temperature and pressure, so as to cause the elements of those bodies to combine with water, and thereby obtain at the same time free fat acids and solution of glycerine. I mix the fatty body to be operated upon with from a third to a half of its bulk of water, and the mixture may be placed in any convenient vessel in which it can be heated to the melting-point of lead, until the operation is complete. The vessel must be closed and of great strength, so that the requisite amount of pressure may be applied to prevent the conversion of the water into steam.

“The process may be performed more rapidly and also continuously by causing the mixture of fatty matter and water to pass through a tube or continuous channel, heated to the temperature already mentioned, the requisite pressure for preventing the conversion of water into steam being applied during the process, and this I believe is the best mode of carrying my invention into effect. In the drawing hereunto annexed are shown figures of an apparatus for performing this process speedily and continuously, but which apparatus I do not intend to claim as any part of my invention.”

The specification then goes on to describe, by the aid of the drawing referred to, the particular device mentioned. But it is evident, and indeed is expressly announced, that the process claimed does not have reference to this particular device, for the apparatus described was well known, being similar to that used for producing the hot-blast and for heating water for the purpose of warming houses. It consists of a coil of iron pipe, or other metallic tubing, erected in an oven or furnace, where it can be subjected to a high degree of heat, and through this pipe the mixture (of nearly equal parts of fat and water), made

into an emulsion in a separate vessel by means of a rapidly vibrating piston, or dasher, is impelled by a force-pump in a nearly continuous current, with such regulated velocity as to subject it to the heat of the furnace for a proper length of time to produce the desired result, which time, when the furnace is heated to the temperature of 612° Fah., is only about ten minutes. The fat and water are kept from separating by the vertical position of the tubes, as well as by the constant movement of the current, and are prevented from being converted into steam by weighting the exit valve by which the product is discharged into the receiving vessel, so that none of it can escape except as it is expelled by the pulsations produced by the working of the force-pump. Before arriving at the exit valve, the pipe is passed, in a second coil, through an exterior vessel filled with water, by which the temperature of the product is reduced. After the product is discharged into the receiving vessel, it is allowed to stand and cool until the glycerine settles to the bottom and separates itself from the fat acids. The latter are then subjected to washing and hydraulic pressure in the usual way

After describing this apparatus it is added —

“Although the decomposition of the neutral fats by water takes place with great quickness at the proper heat, yet I prefer that the pump should be worked at such a rate, in proportion to the length or capacity of the heating tubes, that the mixture, while flowing through them, should be maintained at the desired temperature for ten minutes before it passes into the refrigerator or cooling part of the apparatus.”

It is evident that the passing of the mixture of fat and water through a heated coil of pipe standing in a furnace is only one of several ways in which the process may be applied. The patentee suggests it as what he conceived to be the best way, apparently because the result is produced with great rapidity and completeness. But other forms of apparatus, known and in public use at the time, can as well be employed without changing the process. A common digester, or boiler, can evidently be so used, provided proper means are employed to keep up the constant admixture of the water and fat, which

is a *sine qua non* in the operation. Tilghman himself, as we have seen, often used such digesters in making his experiments before applying for his patent, and, in putting up machinery for his licensees after his patent was obtained, he did the same thing when the parties desired it. Yet surely the identity of the process was not changed by thus changing the form of apparatus. No great amount of invention was required to adapt different forms of well-known apparatus to the application of the process. The principal difficulty would be in providing an internal arrangement in the boiler, or digester, for successfully keeping up the intimate commixture of the fat and water. It is evident that this could be accomplished by means of revolving reels armed with buckets, or of a force-pump constantly transferring the heavy stratum of water from the bottom of the mass to the top, aided by horizontal diaphragms partially sectionizing the digester. These devices were resorted to by Tilghman and others when they used a boiler instead of a coil of pipe.

Whilst Tilghman in his patent recommends the high degree of heat named, he does not confine himself to that. It had been fully developed in his experiments, and was well known to him, that a lower degree of heat could be employed by taking longer time to perform the operation, and this would be necessary when boilers, or digesters, of considerable size were used instead of the coil of pipe, on account of the decreasing power of large vessels to resist the internal pressure. The specification, after describing the use of a metallic coil of pipe, proceeds to add —

“The melting-point of lead has been mentioned as the proper heat to be used in this operation, because it has been found to give good results. But the change of fatty matters into fat acid and glycerine takes place with some materials (such as palm-oil) at or below the melting-point of bismuth [510° Fah.], yet the heat has been carried considerably above the melting-point of lead without any apparent injury, and the decomposing action of the water becomes more powerful as the heat is increased. By starting the apparatus at a low heat, and gradually increasing it, the temperature giving products most suitable to the intended application of the fatty body employed can easily be determined.”

Now, when we find it stated, as we do in this specification, that the patentee subjects "fatty or oily bodies to the action of water at a high temperature and pressure, so as to cause the elements of those bodies to combine with water," that "the mixture may be placed in any convenient vessel in which it can be heated to the melting-point of lead, until the operation is complete," that "the vessel must be closed and of great strength, so that the requisite amount of pressure may be applied to prevent the conversion of the water into steam," that "the decomposition of the neutral fats by water takes place with great quickness at the proper heat," that "the melting-point of lead has been mentioned as the proper heat to be used in this operation, because it has been found to give good results;" that "the change of fatty matters into fat acid and glycerine takes place with some materials at or below the melting-point of bismuth," that "the decomposing action of water becomes more powerful as the heat is increased," that "by starting the apparatus at a low heat, and gradually increasing it, the temperature giving products most suitable to the intended application of the fatty body employed can easily be determined," and when we then find that the patentee categorically claims, in general terms, as his invention "*the manufacturing of fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure*," and being satisfied that he was, in fact, the inventor of the general process described and bodied forth in the specification, — how can we, by any fair rule of construction, circumscribe this claim in such a manner as that it shall only cover the process when applied in the use of a coil of pipe heated to 612° Fahrenheit? Or, if we allow it to embrace any "convenient vessel," and do not confine it to a coil of pipe, how can we confine it to a particular degree of heat? What did Tilghman discover? And what did he, in terms, claim by his patent? He discovered that fat can be dissolved into its constituent elements by the use of water alone under a high degree of heat and pressure, and he patented *the process* of "manufacturing fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure." Had the process been known and used before, and not been Tilghman's invention, he could not then have claimed anything more than the

particular apparatus described in his patent, but being the inventor of the process, as we are satisfied was the fact, he was entitled to claim it in the manner he did.

That a patent can be granted for a process, there can be no doubt. The patent law is not confined to new machines and new compositions of matter, but extends to any new and useful art or manufacture. A manufacturing process is clearly an art, within the meaning of the law. Goodyear's patent was for a process, namely, the process of vulcanizing india-rubber by subjecting it to a high degree of heat when mixed with sulphur and a mineral salt. The apparatus for performing the process was not patented, and was not material. The patent pointed out how the process could be effected, and that was deemed sufficient. Neilson's patent was for the process of applying the hot-blast to furnaces by forcing the blast through a vessel or receptacle situated between the blowing apparatus and the furnace, and heated to a red heat, the form of the heated vessel being stated by the patent to be immaterial. These patents were sustained after the strictest scrutiny and against the strongest opposition.

On the subject of patents for processes, Mr. Justice Grier, in delivering the opinion of this court in *Corning v. Burden*, said "A process *eo nomine* is not made the subject of a patent in our act of Congress. It is included under the general term, 'useful art.' An art may require one or more processes in order to produce a certain result or manufacture. The term 'machine' includes every mechanical device or combination of mechanical powers and devices to perform some function or to produce a certain effect or result. But where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or of one substance to another, such modes, methods, or operations are called processes. A new process is usually the result of a discovery, a machine of invention. The arts of tanning, dyeing, making water-proof cloth, vulcanizing india-rubber, smelting ores, and numerous others, are usually carried on by processes as distinguished from machines. One may discover a new and useful improvement in the process of tanning, dyeing, &c., irrespective of any particular form of machinery or mechanical device. And another

may invent a labor-saving machine, by which the operation or process may be performed, and each may be entitled to his patent. As, for instance, A. has discovered that by exposing india-rubber to a certain degree of heat, in mixture or connection with certain metallic salts, he can produce a valuable product or manufacture he is entitled to a patent for his discovery, as a process or improvement in the art irrespective of any machine or mechanical device. B., on the contrary, may invent a new furnace, or stove, or steam apparatus, by which this process may be carried on with much saving of labor and expense of fuel, and he will be entitled to a patent for his machine as an improvement in the art." 15 How 252, 267

Neilson's patent above referred to had some features very similar to those of Tilghman's. The strong objection urged against the latter is, that the particular apparatus described in the specification is not that which is generally used, and that it cannot be used with much profit or success in large manufacturing operations, whereas the slower method of dissolving fats in a common boiler, or digester, at a lower temperature even than that of melting bismuth, which is not described in the specification, is the one which is generally adopted. Precisely this circumstance existed in reference to the patent of Neilson. The specification directed that the blast or current of air produced by the blowing apparatus should be passed into an air-vessel or receptacle heated to a red heat; and from thence into the furnace. Then, after stating that the air-vessel or receptacle should be increased in size according to the size of the forge or furnace to be supplied, the specification adds "The form or shape of the vessel or receptacle is immaterial to the effect, and may be adapted to the local circumstances or situation." Now, the most simple and natural form of an air-vessel, for heating the blast, as here directed, would be a box or chamber, or a cylindrical vessel, but it turned out in practice that a receptacle of this kind would answer the purpose but very imperfectly, and that the best and most useful method was to heat the blast in a series of tubes placed in a heated oven. This was held to be no ground for invalidating the patent, or for preventing it from covering intermediate tubes, as well as an intermediate box or chamber, the jury being of

opinion that a man of ordinary skill and knowledge in the construction of blowing and air-heating apparatus would be able, from the information contained in the specification, to erect a machine which would answer some beneficial purpose in the application of the process, and would not be misled and prevented from so doing by the declaration that the form or shape of the vessel or receptacle was immaterial to the effect. In this view of the subject the patent was sustained after very great consideration.

Some question has, indeed, been made whether Neilson's patent was sustained as a patent for a process. The Court of Exchequer, in reviewing the proceedings at the trial, and answering the objection that it was a patent for a principle, said "It is very difficult to distinguish it from the specification of a patent for a principle, and this at first created in the minds of some of the court much difficulty, but, after full consideration, we think that the plaintiff does not merely claim a principle, but a machine embodying a principle, and a very valuable one. We think the case must be considered as if, the principle being well known, the plaintiff had first invented *a mode of applying it* by a mechanical apparatus to furnaces, and his invention consists in this, — *by interposing a receptacle for heated air between the blowing apparatus and the furnace.* In this receptacle he directs the air to be heated by the application of heat externally to the receptacle, and thus he accomplishes the object of applying the blast, which was before of cold air, in a heated state to the furnace." Web. P. C. 275, 371.

In this passage, we think that the Court of Exchequer (who spoke through Baron Parke) drew the true distinction between a mere principle, as the subject of a patent, and a process by which a principle is applied to effect a useful result. That a hot-blast is better than a cold-blast for smelting iron in a furnace was the principle or scientific fact discovered by Neilson, and yet, being nothing but a principle, he could not have a patent for that. But having invented and practically exemplified a process for utilizing this principle, namely, that of heating the blast, in a receptacle, between the blowing apparatus and the furnace, he was entitled to a patent for that process, although he did not distinctly point out all the forms of appa-

tus by which the process might be applied, — having, nevertheless, pointed out a particular apparatus for that purpose, and having thus shown that the process could be practically and usefully applied. Another person might invent a better apparatus for applying the process than that pointed out by Neilson, and might obtain a patent for such improved apparatus, but he could not use the process without a license from Neilson. His improved apparatus would, in this respect, stand in a relation to the process analogous to that which an improvement on a patented machine bears to the machine itself.

That Neilson's patent was regarded as for a process is apparent from what is said by the judges who had it under consideration. Thus Baron Parke at the trial had said "The specification and patent together make it clear what the discovery was. it was the introduction of hot air by means of heating it before it was introduced into the furnace, between the blowing apparatus and the furnace." Web. P. C. 275, 312. And when the matter came before the House of Lords, after a trial in Scotland, Lord Campbell said "After the construction first put upon it [the patent] by the learned judges of the Court of Exchequer, sanctioned by the high authority of my noble and learned friend now upon the woolsack, when presiding in the Court of Chancery, I think the patent must be taken to extend to all machines, of whatever construction, whereby the air is heated intermediately between the blowing apparatus and the blast furnace. That being so, the learned judge was perfectly justified in telling the jury that it was unnecessary for them to compare one apparatus with another, because, confessedly, that system of conduit pipes was a mode of heating air by an intermediate vessel between the blowing apparatus and the blast furnace, and, therefore, it was an infraction of the patent." Id. 715.

This case of the hot-blast was commented upon in the great case of *O'Reilly v Morse*, and is there recognized and approved in the opinion of this court delivered by Chief Justice Taney. After quoting the remarks of Baron Parke in the Court of Exchequer, cited above, the Chief Justice says. "We see nothing in this opinion differing in any degree from the familiar principles of law applicable to patent cases. Neilson claimed

no particular mode of constructing the receptacle, or of heating it. He pointed out the manner in which it *might* be done, but admitted that it might also be done in a variety of ways, and at a higher or lower temperature, and that all of them would produce the effect in a greater or less degree, provided the air was heated by passing through a heated receptacle. Whoever, therefore, used this method of throwing hot air into the furnace, used the process he had invented, and thereby infringed his patent, although the form of the receptacle or the mechanical arrangements for heating it might be different from those described by the patentee. For whatever form was adopted for the receptacle, or whatever mechanical arrangements were made for heating it, the effect would be produced in a greater or less degree, if the heated receptacle was placed between the blower and the furnace, and the current of air passed through it. The patent was supported because he [Neilson] had invented a mechanical apparatus by which a current of hot air, instead of cold, could be thrown in. And this new method was protected by the patent. The interposition of a heated receptacle in any form was the novelty he invented." 15 How 62, 115, 116.

We have quoted these remarks of the Chief Justice more fully because they show most clearly that he put the same construction upon Neilson's patent that was put upon it by Lord Campbell, and that he fully acquiesced in the legality and validity of a patent for a process. Yet it has been supposed that the decision in *O Reilly v Morse* was adverse to patents for mere processes. The mistake has undoubtedly arisen from confounding a patent for a process with a patent for a mere principle. We think that a careful examination of the judgment in that case will show that nothing adverse to patents for processes is contained in it. The eighth claim of Morse's patent was held to be invalid, because it was regarded by the court as being not for a process, but for a mere principle. It amounted to this, namely, a claim of the exclusive right to the use of electro-magnetism as a motive power for making intelligible marks at a distance, that is, a claim to the exclusive use of one of the powers of nature for a particular purpose. It was not a claim of any particular machinery, nor a claim of any particular

process for utilizing the power, but a claim of the power itself,—a claim put forward on the ground that the patentee was the first to discover that it *could* be thus employed. This claim the court held could not be sustained.

That this was the true ground of the decision will be manifest from the following observations of the Chief Justice in the opinion already quoted from. He says. "He [Morse] claims the exclusive right to every improvement where the motive power is the electric or galvanic current, and the result is the marking or printing intelligible characters, signs, or letters at a distance. If this claim can be maintained, it matters not by what *process* or *machinery* the result is accomplished. For aught that we now know, some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. In fine, he claims an exclusive right to use a *manner and process* which he has not described, and indeed had not invented, and therefore could not describe when he obtained his patent. The court is of opinion that the claim is too broad, and not warranted by law. It is the high praise of Professor Morse that he has been able by a new combination of known powers, of which electro-magnetism is one, to discover a method by which intelligible marks or signs may be printed at a distance. And for the method or process thus discovered he is entitled to a patent. But he has not discovered that the electro-magnetic current, used as a motive power, in any other method, and with any other combinations, will do as well." After reviewing the statutes and decisions bearing upon the subject, the Chief Justice makes a summary conclusion of the whole matter, as follows "Whoever discovers that a certain useful result will be produced, in any art, machine, manufacture, or composition of matter, by the use of certain means, is entitled to a patent for it, provided he specifies the means he uses in a manner so full and exact that any one skilled in the science to which it appertains can, by using the means he specifies, without any addition to or subtraction from them, produce precisely the result he describes. And if this cannot be done by the means he describes, the pat-

ent is void. And if it can be done, then the patent confers on him the exclusive right to use the means he specifies to produce the result or effect he describes, and nothing more. And it makes no difference, in this respect, whether the effect is produced by chemical agency or combination, or by the application of discoveries or principles in natural philosophy, known or unknown before his invention, or by machinery acting altogether upon mechanical principles. In either case, he must describe *the manner or process* as above mentioned, and the end it accomplishes. And any one may lawfully accomplish the same end without infringing the patent, if he uses means substantially different from those described." Id. 119.

It seems to us that this clear and exact summary of the law affords the key to almost every case that can arise. "Whoever discovers that a certain useful result will be produced in any art by the use of certain means is entitled to a patent for it, provided he specifies the means." But everything turns on the force and meaning of the word "means." It is very certain that the means need not be a machine, or an apparatus, it may, as the court says, be a *process*. A machine is a thing. A process is an act, or a mode of acting. The one is visible to the eye, — an object of perpetual observation. The other is a conception of the mind, seen only by its effects when being executed or performed. Either may be the means of producing a useful result. The mixing of certain substances together, or the heating of a substance to a certain temperature, is a process. If the mode of doing it, or the apparatus in or by which it may be done, is sufficiently obvious to suggest itself to a person skilled in the particular art, it is enough, in the patent, to point out the process to be performed, without giving supererogatory directions as to the apparatus or method to be employed. If the mode of applying the process is not obvious, then a description of a particular mode by which it may be applied is sufficient. There is, then, a description of the process and of one practical mode in which it may be applied. Perhaps the process is susceptible of being applied in many modes and by the use of many forms of apparatus. The inventor is not bound to describe them all in order to secure to himself the exclusive right to the process, if he is really its inventor or dis-

coverer. But he must describe some particular mode, or some apparatus, by which the process can be applied with at least some beneficial result, in order to show that it is capable of being exhibited and performed in actual experience.

Let us apply these principles to the present case. In the first place, the claim of the patent is not for a mere principle. The chemical principle or scientific fact upon which it is founded is, that the elements of neutral fat require to be severally united with an atomic equivalent of water in order to separate from each other and become free. This chemical fact was not discovered by Tilghman. He only claims to have invented a particular mode of bringing about the desired chemical union between the fatty elements and water. He does not claim every mode of accomplishing this result. He does not claim the lime-saponification process, nor the sulphuric-acid distillation process, and if, as contended, the result was accomplished by Dubrunfaut, Wilson, and Scharling, by means of steam distillation, he does not claim that process. He only claims the process of subjecting to a high degree of heat a mixture continually kept up, of nearly equal quantities of fat and water in a convenient vessel strong enough to resist the effort of the mixture to convert itself into steam. This is most certainly a process. It is clearly pointed out in the specification, and one particular mode of applying it and carrying it into effect is described in detail. But it is not the particular apparatus described which Tilghman desires to secure by his patent. Having pointed out the process and suggested a particular mode of applying it, he claims as his invention "*the manufacturing of fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure.*" The true construction of this claim is to be sought by comparing it, as we have already done, with the context of the specification, with the statement of the patentee that his "invention consists of a *process* for producing free fat acids and solution of glycerine from those fatty and oily bodies of animal and vegetable origin, which contain glycerine as a base," that "for this purpose he subjects these fatty and oily bodies to the action of water at a high temperature and pressure, so as to cause the elements of those bodies to combine with water and thereby obtain at the same time

free fat acids and solution of glycerine," that he "mixes the fatty body to be operated upon with from a third to a half of its bulk of water, and the mixture may be placed in any convenient vessel in which it can be heated to the melting-point of lead" [which is afterwards explained to be only desirable for a quick result, not essential], that "the vessel must be closed and of great strength, so that the requisite amount of pressure may be applied to prevent the conversion of the water into steam." This is the process which the patentee claims to have invented, and this description of it gives the proper construction and qualification to the claim.

It is objected that the particular apparatus described in the patent for carrying the process into effect cannot be operated to produce any useful result. We have examined the evidence on this point, and are satisfied that it shows the objection to be unfounded. A recapitulation of this evidence is not necessary. The testimony of Tilghman himself, of Professor Booth, and of Mr. Wilson is directly to the point.

It only remains that we should express our views on the question of infringement. The defendants advance several reasons for the purpose of showing that their process does not conflict with that of Tilghman. First, because they do not use the apparatus described in the complainant's patent, but use a boiler in which the charge of fat and other materials is placed and heated, and do not mix the fat and water in the manner pointed out in the specification of the patent, but, on the contrary, have inserted in the boiler a pump which forces the water as it settles to the bottom upwards to the top of the mass and pours it upon the upper surface, whence it again finds its way down through the fat, thus keeping up a constant mixture. It is unnecessary to add anything further on the subject of the form of the apparatus used. The patentee is not confined to a metallic coil of pipe heated in a furnace, but his patent extends to and embraces any convenient vessel for holding the mixture, which is strong enough to sustain the pressure necessary to prevent the water from being converted into steam. The defendants use such a vessel, and use it for the purpose indicated and pointed out in the patent. The vessel which they use has the requisite strength to prevent the water from

being converted into steam, and does effect that object. And as to the defendants' using a different method from that suggested in the patent for keeping up the mixture of fat and water, that is of no consequence. The keeping up of the mixture is the important thing. That is a necessary part of the process. They employ such a device for effecting this as is adapted to the form of vessel in which they heat the material. Using a boiler instead of a coil of pipe for this purpose, they are obliged to employ an additional or modified means for keeping up the mixture. They only employ such means as, in view of the change adopted in the form of the heating apparatus, and of the known appliances in use in analogous processes, would naturally suggest themselves to a mechanic skilled in the art. Or, if the mode of effecting the continued mixture adopted by the defendants should be deemed a new and useful improvement, they might perhaps have a patent for that peculiar device without being entitled to use Tilghman's process, on which it is but an improvement.

Another ground on which the defendants argue that they do not infringe the patent is, that they do not, in their process, use water alone in admixture with fat, but use also some portion of lime that they formerly used seven per cent of lime, and now use four per cent. But they do not use lime in the manner and to the extent in which it is used for dissolving fats by the saponifying process. That requires twelve or fourteen per cent. Even if the saponifying process partly takes place, they use Tilghman's process for effecting the balance of the operation. They use water in admixture with fat, heated to a high degree, far above the boiling-point. and yet subjected to such pressure as to prevent the water from being converted into steam and though they may also use other things at the same time, which other things may facilitate the operation, or render a less degree of heat necessary than would be required when water alone is used, and thus actually improve the process of Tilghman, yet this process is included in their operation, and forms the basis of it. It is idle, therefore, to say that they do not infringe Tilghman's patent. It is unnecessary to determine what precise part the lime used by the defendants plays in their process, whether, as the complainant

contends, it saponifies the fat to a certain extent, leaving the remainder to be acted upon by the water alone purely after the process of Tilghman, or whether, as the defendants contend, the lime produces a more perfect and active commixture of the fat and water, or predisposes the fat to unite with the requisite elements of water necessary for producing glycerine and the fat acids,—in either case the process of Tilghman, modified or unmodified by the supposed improvement, underlies the operation performed in the defendants' boilers.

Another ground assumed by the defendants to avoid the charge of infringement is, that they do not heat the mixed mass in the manner pointed out in Tilghman's specification, but, instead of heating the containing vessel by an outside application of heat, they heat the contents by the introduction of super-heated steam. But we think that this does not alter the essential character of the process. The heating by steam is clearly an equivalent method to that of heating by an external fire. The patent does not prescribe any particular method of applying the heat, except when using the pipe and coil apparatus described in the specification, and, even in the use of this apparatus, the outward application of the heat to the pipe is suggested incidentally and as a matter of convenience rather than as an essential requisite. The patentee showed one method in which the heat could be applied. That was all that was necessary for him to do. If it could be applied in any number of different methods, it would not affect the validity of the patent as a patent for a process. The method of heating the mixture by the introduction of steam may be attended with some beneficial results, in producing an agitation, or automatic circulation helpful to the perfection of the admixture of the water and fat, and so far it may be an improvement on heating from without. Suppose this to be so, as before said, the introduction of an improvement gives no title to use the primary invention upon which the improvement is based.

Finally, the defendants argue that they only use a low degree of heat and pressure compared with that pointed out by the patent, namely only about 310° Fah. instead of 612° The precise degree of heat, as we have seen, is not of the

essence of the patent. The specification only claims that a high degree of heat, such as would be sufficient to melt lead, is most effective and rapid in producing the desired result, but suggests a trial of the apparatus employed with different degrees of heat so as to ascertain that which is best for each particular kind of fat. "By starting the apparatus," the language is, "at a low heat, and gradually increasing it, the temperature giving products most suitable to the intended application of the fatty body employed can easily be determined." It is probably true, as contended for by the defendants, that by the use of a small portion of lime, the process can be performed with less heat than if none is used. It may be an improvement to use the lime for that purpose, but the process remains substantially the same. The patent cannot be evaded in that way. The matter may be stated thus: Tilghman discovers a process of decomposing fats by mixing them with water, and heating the mixture to a high temperature under a pressure that prevents the formation of steam. It is a new process, never known before. The defendants seeing the utility of the process, and believing that they can use a method somewhat similar without infringing Tilghman's patent, put a little lime into the mixture, and find that it helps the operation, and that they do not have to use so high a degree of heat as would otherwise be necessary. Still, the degree of heat required is very high, at least a hundred degrees above the boiling-point, and a strong boiler or vessel is used in order to restrain the water from rising into steam. Can a balder case be conceived of an attempted evasion and a real infringement of a patent?

And as to the low degree of heat used in the operations of the defendants, this must also be said: that, with the reduction of the temperature, the time of perfecting the operation is more than proportionally increased. Tilghman was aware of this result, and pointed it out in his patent. He expressly says "The decomposing action of the water becomes more powerful as the heat is increased." What can be done in minutes by the application of a very high degree of heat, requires hours to do at the temperature used by the defendant. But the process is still the same, and the defendants fail to evade the patent.

We pass by the fact that the defendants first took a license from the patentee, and under it and under his directions erected substantially the same apparatus which they are yet using. Receiving what they regarded as additional light, they refused to continue the payment of a royalty, and put the complainant to his legal remedy.

It is our opinion that the patent is for a process, that it is a valid patent, and that the defendants infringe it.

We have considered the case entirely upon its merits. It is unnecessary to bestow much discussion upon the technical objections that have been raised. They have not been pressed in the argument, and are probably not seriously relied on. One of them is, that no replication was filed in the case. To this it may be answered, that the parties have throughout treated the case as though it were regularly at issue. The various stipulations into which they have entered, with regard to the admission of evidence to be heard on the trial of the cause, are totally inconsistent with the idea that the case was to be heard merely on bill and answer. Another objection is, that the patent was dated more than six months prior to the filing of the application for it. But under the law then in force (1854) with regard to the antedating of patents where a foreign patent had been obtained, this was admissible. The sixth section of the act of March 3, 1839, entitled "An Act in addition to an act to promote the progress of the useful arts," expressly declared "that no person shall be debarred from receiving a patent for any invention or discovery by reason of the same having been patented in a foreign country more than six months prior to his application *Provided*, that the same shall not have been introduced into public and common use in the United States prior to the application for such patent *And provided also*, that in all cases every such patent shall be limited to the term of fourteen years from the date or publication of such foreign letters-patent." Now, we know by the proceedings on the application in this case that the attention of the Commissioner of Patents was expressly called to the fact of the issuing of the English patent, and that the question of the date of the patent in suit was submitted to and considered by him. Under the laws then in force, he

determined that the patent ought to be antedated as of the date of the English patent. It must be presumed that his decision was right according to the facts of the case, at least until the contrary is shown, and nothing has been shown to the contrary by any evidence in the cause to which our attention has been called.

The decree of the Circuit Court will be reversed, and the cause remanded with directions to enter a decree in conformity with this opinion, and it is

*So ordered.*